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RESEARCH NOTE

Salmonella Enteritidis in Bosnia and Herzegovina

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ABSTRACT

A comprehensive retrospective analysis of human *Salmonella* Enteritidis isolates in the Zenica-Doboj Canton of Bosnia and Herzegovina was conducted by inquiry and questionnaire. In the period 1998–2000, 299 isolates of *Salmonella* spp. were recorded, of which *S.* Enteritidis accounted for 74.2%. The isolation rate of *S.* Enteritidis increased during this period, from 12.7 to 25.5 isolates/year/100 000 population. Isolates were obtained all year round, mostly from sporadic cases of infection or limited family outbreaks. Home-made food was identified as the most important source of infection, being implicated in 81% of outbreaks and 81.7% of cases of sporadic infection.

Keywords Bosnia and Herzegovina, food-borne infection, *Salmonella* Enteritidis

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Salmonella Enteritidis has emerged worldwide since 1980 as the commonest serotype isolated from cases of human food-borne disease [1,2]. There is no national *Salmonella* centre in Bosnia and Herzegovina, so surveillance of *Salmonella* infections is primarily the responsibility of the Canton Institutes for Public Health. These centres receive mandatory daily morbidity reports from general practitioners, as well as notification records of patients with *Salmonella* infection. Epidemiologists then conduct local surveys and interview members of the patient's household and other individuals who may have been exposed. A standard questionnaire is used that requests demographic and socio-economic data and records information on date of onset of illness, date of inquiry, dietary habits, food preferences, ownership of pets and other animals, consumption of food and water, and travel abroad in the 3 days before the onset of illness. In particular, patients were asked to report their own belief concerning the source of the infection.

A comprehensive retrospective analysis of all human *S.* Enteritidis isolates was conducted by inquiry and systematic examination of the questionnaires. Recorded cases were classified as either: (1) *verified*, if the agent was isolated from both an ill patient and a food source, or if the agent was isolated from either the food or the patient and a link could be determined on the basis of the information in the questionnaire; or (2) *probable*, if the association, based solely on information collected during the interview, was sufficiently strong, e.g., several cases with similar symptoms and only one meal in common.

Faecal specimens were streaked onto Salmonella-Shigella (SS) agar (Oxoid, Basingstoke, UK) directly and after overnight incubation at 37°C in selenite enrichment broth (Oxoid). Microbiological analysis of food products was performed routinely at the Laboratory for Sanitary and Clinical Microbiology (Canton Institute Public Health, Zenica), according to the standards and legal regulations of the Republic/Federation of Bosnia and Herzegovina. *Salmonella* was detected in food products by homogenising 25 g of food sample in 250 mL selenite broth and incubating overnight at 37°C, and then subculturing on SS agar. Following a further incubation period overnight at 37°C, colonies were identified and serotyped by conventional microbiological methods [3]. Each patient was registered only once, even if more than one episode of infection had occurred or the patient had been registered in more than one database.

Two microbiology laboratories in the Zenica-Doboj Canton serve a total population of 331 229, divided into an urban area with 149 053 inhabitants, and a rural area with 182 176 inhabitants. In the period 1998–2000, 299 isolates of *Salmonella* spp. were recorded, of which *S.* Enteritidis accounted for 74.2%. The isolation rate of *S.* Enteritidis increased during this period from 12.7 to 25.5/year/100 000 population. The average annual age-specific rates of *S.* Enteritidis were highest among children aged < 6 years in both the urban and rural areas. The cases occurred all year round, although the maximum seasonal peak was observed during September and October.

Not all infected individuals develop symptoms severe enough to need medical attention, but even when this is the case, the physician may not send the patient's stool for analysis. Thus, as many cases of *Salmonella* infection are not reported, the figures recorded (Table 1) probably represent only a fraction of the actual number of cases that occur, as has been shown in many other countries [1,4]. Most infections in this region with *S.* Enteritidis occur as sporadic cases or limited family outbreaks (mean of three cases/outbreak) rather than as part of large common-source outbreaks. However, apparently sporadic cases

Table 1. *Salmonella* Enteritidis infections in the Zenica-Doboj Canton, Bosnia and Herzegovina

Year	Verified no. of outbreaks	Verified no. of individuals affected in outbreaks	Probable no. of individuals affected in outbreaks[a] (no. of outbreaks involved)	Verified no. of sporadic cases	Probable no. of sporadic cases[a] (probable no. of outbreaks)
1998	5	24	1 (1)	31	10 (5)
1999	10	26	7 (3)	47	22 (11)
2000	12	24	4 (3)	86	58 (19)
1998–2000 total	27	74	11 (7)	164	90 (35)

[a]Individuals who did not visit a physician. Data extracted from the patient's records and from questionnaires.

may frequently represent unrecognised outbreaks (Table 1).

Home-made food was the most important source of *S.* Enteritidis infection in this region, being implicated in 22 (81%) outbreaks and 134 (81.7%) sporadic infections. This rate is higher than that in some other reports [2,5]. If imperfect practice in kitchens has contributed to the striking increase in *S.* Enteritidis food poisoning in Bosnia and Herzegovina, this may be evidence that standards have declined in recent years, i.e., the post-war period.

For outbreaks in which the implicated food was investigated bacteriologically, and in those cases where epidemiological information regarding the suspected food was recorded, the main sources of infection were eggs and food containing eggs (33%), milk and milk products (22%), and minced beef (18%). Although this supports previous findings that eggs and egg products are the commonest vehicles of *S.* Enteritidis transmission [2,4], the large proportion of cases involving raw milk (22%) suggests that cattle from rural areas may represent an important source of infection. However, because of limited resources, food samples were examined from only five (19%) *S.* Enteritidis outbreaks during this 3-year period. Although the surveillance system for the sources of *S.* Enteritidis infections in this region is inadequate, this is also a problem in many other countries [1,2]. Medical staff in general practice should be strongly encouraged to report suspected cases to local public health authorities, and consistent criteria should be developed for their investigation.

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RESEARCH NOTE

Increasing incidence of resistance to nalidixic acid in shigellas from humans in England and Wales: implications for therapy

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ABSTRACT

Among shigellas isolated from patients in England and Wales in 2002, 10% of subgroups A, B and C, and 13% of subgroup D (*Shigella sonnei*), were resistant to nalidixic acid. As a consequence, should antimicrobial therapy be indicated, the efficacy of nalidixic acid as the preferred treatment for children with bacillary dysentery has been jeopardised.

Keywords Dysentery, nalidixic acid, quinolones, resistance, *Shigella*, therapy

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The normal presentation of bacillary dysentery caused by *Shigella* isolates of subgroups A, B, C (*Shigella dysenteriae*, *S. flexneri*, *S. boydii*) and D (*S. sonnei*) is that of mild-to-moderate gastroenteritis. The disease is self-limiting, and the primary therapy is oral rehydration. However, symptoms can be severe in the very young, the very old, the malnourished and patients with other underlying diseases [1]. In such cases, administration of an effective antimicrobial agent should commence as soon as the clinical diagnosis is made. Ampicillin was the drug of choice until the mid-1980s [2], but this agent was compro-

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